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#198 — 31/32 Ann. Rpts 1919/1920
#203 — 33d Ann. Rpt 1921
#208 — 34th Ann. Rpt. 1922

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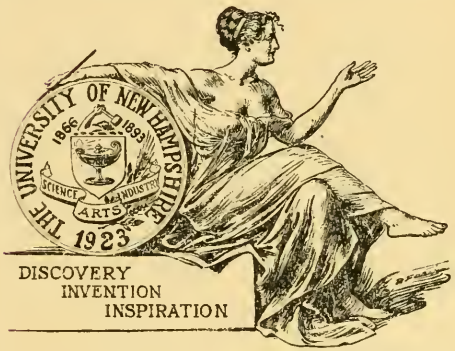

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NUMBER N53 179-208
ACCESSION 4798 c.3

Bulletin No. 196 November, 1920

NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION

DEPARTMENT OF CHEMISTRY

INSPECTION OF COMMERCIAL FERTILIZERS FOR 1920

MADE FOR THE
STATE DEPARTMENT OF AGRICULTURE

By H. R. Kraybill, T. O. Smith and C. P. Spaeth

4405

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
DURHAM, N. H.

Inspection of Commercial Fertilizers

This report presents the data obtained in connection with the annual inspection of commercial fertilizers made by the State Department of Agriculture, under the direction of Mr. Andrew L. Felker, Commissioner of Agriculture. Mr. Eugene D. Sanborn, State Inspector, visited nearly every section of the state and collected samples of 100 different brands.

A careful study of the analyses and prices of the various brands offered for sale in the state demonstrates that in order to purchase economically it is necessary to know what the analysis means and how to calculate the relative values of the different brands of fertilizers. The following illustration will be sufficient to demonstrate the wisdom of careful selection of fertilizers. During the past season one brand of 16 per cent acid phosphate, which contained 16.60 per cent available phosphoric acid sold for $50 per ton, and another brand of 16 per cent acid phosphate, which contained 16.74 per cent of available phosphoric acid sold for $25 per ton. The value of the material was the same, but the price of one brand was twice that of the other. It is with the hope that the purchaser of fertilizers will be aided in making his selections that the following discussion of the meaning of the analysis is presented.

MEANING OF THE CHEMICAL ANALYSIS.

There are three of the ten elements essential for plant growth which are most apt to be lacking in sufficient available quantity for best crop growth in our usual soils. These are nitrogen, phosphorus and potassium. Sometimes calcium and sulphur may be deficient, but because these deficiencies have apparently not been so marked and wide spread our fertilizer practices have dealt mostly with the application of nitrogen, phosphorus and potassium. The value of commercial fertilizers depends, therefore, upon their available content of these three elements. For this

reason manufacturers are required to state upon their label the guaranteed content of these three materials.

Nitrogen. Pure nitrogen is a colorless, odorless, tasteless gas which makes up about four-fifths of the air surrounding us. In this form, however, it is not available to plants with the exception of a few, such as legumes, which are able to get nitrogen from the air by means of the bacteria which exist upon their roots. In order to be available for plants nitrogen must be in the form of a compound known as a nitrate.

In commercial fertilizers the nitrogen occurs in three different forms as follows: (1) nitrate, (2) ammonia and (3) organic nitrogen. The nitrate nitrogen is readily soluble in water and immediately available to the plant. The ammonia nitrogen and organic nitrogen must be converted into the nitrate form before they are available to the plant. The ammonia nitrogen becomes available quite rapidly during the growing season and so can be considered as an available form. Some types of organic nitrogen such as are contained in dried blood, cottonseed meal, tankage, etc., are also rapidly converted into nitrate nitrogen in the soil and made available to the plant. Other types of organic nitrogen like those contained in hoof, hair and leather waste, however, are only very slowly converted into nitrate nitrogen and are not readily available.

Phosphorus occurs in the various fertilizer materials in the greater part as phosphoric acid in combination with calcium (or lime). In order to be available to plants these compounds of lime and phosphorus must be soluble or made soluble. The amount of lime combined with the phosphoric acid determines the solubility of the material; that containing the smaller amount of lime being more soluble. That part of the phosphoric acid which is readily soluble in water is immediately available to the plant during the growing season. This is known as "water soluble" phosphoric acid. A part of the phosphoric acid which is insoluble in water is soluble in a certain strength of ammonium citrate solution. This is also available to the plant. In the analysis the "available" phosphoric acid includes the "water soluble" and the "citrate soluble." The insoluble may be obtained by subtracting the available from the total in the tables of analyses. The "insoluble" phosphoric becomes available to the plant only very slowly.

Potassium occurs in commercial fertilizers usually in the form of a chloride (muriate) or sulphate. Only the water soluble potassium is readily available to plants. The analysis, therefore, expresses the percentage of "water soluble" potash (K_2O).

Statement of the Analysis. There are numerous ways of expressing the amounts of nitrogen, phosphoric acid and potash contained in a fertilizer. The purchaser should not be mislead by these statements. For instance, if a fertilizer contains 3 per cent of nitrogen it may be expressed as nitrogen 3 per cent, as nitrogen equivalent to 3.63 per cent ammonia or as nitrogen equivalent to 14.1 per cent of ammonium sulphate. The per cent of nitrogen is the thing which is important and is the figure which should be used in calculating the value of the fertilizer. The following shows how to calculate the per cent of nitrogen from the per cent of ammonia and vice versa. Nitrogen per cent multiplied by 1.21584 gives the per cent of ammonia. The per cent of ammonia multiplied by 0.82247 gives the per cent of nitrogen. Do not be mislead by thinking that a tag stating 3.29 per cent of nitrogen and nitrogen equivalent to 4 per cent of ammonia means that the fertilizer contains the sum of these two. It does not. It means that the fertilizer contains 3.29 per cent of nitrogen only.

For convenience phosphorus is expressed as per cent of "phosphoric acid" or P_2O_5 (Phosphorus pentoxide). The tag usually gives the total per cent of "phosphoric acid," the "water soluble," "citrate soluble" and "insoluble." For the purpose of figuring the value of these we can take the sum of the "water soluble and the "citrate soluble" and call it available phosphoric acid. The per cent of available phosphoric acid is the figure to use in determining the value of the fertilizer. Potassium is expressed as per cent of available K_2O or potash. This is water soluble and available to the plant.

AGRICULTURAL VALUE.

The commercial value of the fertilizer is determined largely by the cost of producing the materials and getting them into the hands of the consumer. The agricultural value is based upon the return in money which the fertilizer yields to the farmer by increased crop production. The commercial value is therefore not necessarily closely related to the agricultural value. It is possible that a

low-priced fertilizer may have a much greater agricultural value upon a certain soil than a high-priced fertilizer and upon another soil the opposite might be true. In selecting a fertilizer it is therefore just as important that the farmer consider the needs of his particular soils and crops as it is to secure the commercially cheapest fertilizer. This suggests the real need for more experimental work to determine the fertilizer needs of the soils of our state.

METHOD OF CALCULATING RELATIVE COMMERCIAL VALUE.

The commercial value of a fertilizer is based upon the content of available nitrogen, "phosphoric acid" (P_2O_5) and potash (K_2O). If we know the guaranteed analysis and the commercial value of a pound of each of the plant foods, we can calculate the relative values of fertilizers.

The terms unit of nitrogen, unit of phosphoric acid or unit of potash are sometimes used to express the amounts instead of the per cent. The term "unit" means 20 lbs. per ton (2000 lbs.) or 1 per cent. One unit then means 1 per cent of a ton or 20 lbs. A fertilizer having 3 per cent nitrogen has three units of nitrogen per ton, or 60 lbs. per ton.

It is impossible to give accurate figures for the cost of the different plant foods for the past season because, due to unsettled conditions, there were rather wide fluctuations. The following list of prices, however, approximates the cost to the manufacturers of the ingredients for mixed fertilizers.

To these must of course be added the cost of mixing, bagging, freight and manufacturers' and dealers' profit to obtain the sale price. For the comparison of the relative value, however, these figures will be satisfactory.

PRICES OF PLANT FOOD MATERIALS.

	Per unit.	Per pound.
Phosphoric acid (P_2O_5) available	$1.20	$0.06
Nitrogen	6.00	0.30
Potash (K_2O) water soluble	2.50	0.125

Either the unit or the pound method can be used to calculate the commercial value of the fertilizer. If we have a fertilizer with the following guaranteed analysis:

Phosphoric acid (P_2O_5) available	3.00%
Nitrogen total	8.00%
Potash (K_2O) water soluble	2.00%

by the unit method we find:

Nitrogen	3 × $6.00 =	$18.00
Phosphoric acid available	8 × 1.20 =	9.60
Potash water soluble	2 × 2.50 =	5.00
Total commercial value		$32.60

By this method we multiply the per cent of each plant food by the cost per unit and then add these figures to give the total value.

Employing the pound method we obtain:

3 × 20 = Number of pounds of nitrogen in a ton	60 × $0.30 =	$18.00
8 × 20 = Number of pounds of phosphoric acid in a ton	160 × 0.06 =	9.60
2 × 20 = Number of pounds of potash water soluble in a ton	40 × 0.125 =	5.00
Total commercial value		$32.60

The per cent means the number of pounds in 100 pounds. Since there are twenty hundred pounds in a ton we multiply the per cent by twenty to find the number of pounds of each plant food in a ton. Then by knowing the value of these per pound we can figure the value of each plant food per ton.

CLASSIFICATION OF SAMPLES ANALYZED.

Table 1 gives the number of samples collected and analyzed in each of the respective classes.

TABLE 1.

Complete Fertilizers	71
Ammoniated Superphosphates	6
Plain Superphosphates	6
Sheep Manures	4
Ground Bone	3
Nitrate of Soda	3
Muriate of Potash	2
Tankage	2
Miscellaneous	2
Sulphate of Ammonia	1
	100

COMPLETE FERTILIZERS.

Seventy-one samples of complete fertilizers were analyzed representing 71 brands. This is over twice the number of complete fertilizers analyzed in 1919. The most striking difference in the brands from those of 1919 is the greater amount of potash they contain. The shortage of potash limited the number of complete fertilizers produced in 1919. Table 2 shows the average analysis and the average retail price paid for the different complete fertilizers.

TABLE 2.

Formula	Number of brands	Average per cent of nitrogen	Average per cent of total phosphoric acid	Average per cent of available phosphoric acid	Average per cent of water soluble potash	Average retail price per ton
1-8-1	1	0.99	9.90	8.27	1.48	$53.00
1-8-2	6	0.87	9.47	8.82	2.12	49.60
1-8-4	1	0.87	9.00	8.00	4.41	55.00
1-10-1	1	0.82	11.80	10.51	1.54	50.00
1-10-2	1	1.07	11.60	10.00	2.16	60.00
2-8-2	14	1.69	9.31	7.99	2.05	55.20
2-8-3	12	1.78	9.39	8.47	3.14	58.80
2-8-4	1	1.46	10.23	8.34	3.90	60.00
2-10-3	1	1.99	18.57	10.59	3.81	65.00
2-10-4	3	1.67	12.30	10.53	4.11	59.60
2-10-6	1	2.90	10.66	10.17	6.38	63.00
3-8-3	3	2.41	9.54	7.79	2.99	68.40
3-3-4	8	2.43	9.46	8.35	4.03	69.80
3-9-2	3	2.49	10.72	9.42	2.28	60.10
4-7-2	1	3.17	9.41	7.17	2.00	73.00
4-8-4	8	3.18	9.44	8.22	3.97	71.00
4-8-6	1	3.78	9.89	8.22	5.77	75.00
4-8-7	1	3.87	10.20	8.11	6.48	67.00
5-8-4	1	4.11	9.24	8.03	3.79	75.00
5-8-7	2	4.21	9.06	8.12	7.16	80.00
6-8-4	1	4.97	7.49	6.32	4.28	90.00

Fourteen brands of 2-8-2 fertilizers show an average of 1.69 per cent nitrogen, 7.99 per cent of available phosphoric acid and 2.05 per cent of potash. The price ranged from $50 to $62 per ton. Twelve samples of 2-8-3 brands averaged 1.78 per cent of nitrogen, 8.47 per cent of available phosphoric acid and 3.14 per cent of potash. The price ranged from $53 to $65 per ton. Eight samples of 3-8-4 brands averaged 2.43 per cent of nitrogen, 8.35 per cent of available phosphoric acid and 4.03 per cent of potash. The price ranged from $63 to $77 per ton. Eight samples of 4-8-4 brands averaged 3.18 per cent of nitrogen, 8.22 per cent of available phosphoric acid and 3.97 per cent of potash. The price of these brands ranged from $60 to $80 per ton.

The fairly wide range in prices within the brands of the same formula shows the importance of paying careful attention to the amount of plant food contained in the fertilizer as shown by the analysis in order to receive full value for the money expended. Sometimes it is possible to buy a brand of a higher formula for the same price or nearly the same as one of a lower formula.

ACIDULATED PHOSPHATES.

Six samples of acid phosphates representing six different brands were analyzed, all of which were guaranteed to contain 16 per cent of available phosphoric acid. None were deficient in available phosphoric acid. The prices obtained by the inspector at the time they were sold show a range of from $25 per ton for a sample showing 16.7 per cent available phosphoric acid to $50 per ton for a sample analyzing 16.60 per cent phosphoric acid. The average price was $33.60 and the average per cent of available phosphoric acid, 16.52. This shows an average retail value of phosphoric acid of $2.03 per unit. The average retail price of the two highest-priced brands was $43 per ton, and the average retail price of the other four was $28.50 per ton. On the basis of the price of the latter four the cost of the phosphoric acid per unit was $1.72. This latter value is very close to the value of $1.71 found by the Pennsylvania Department of Agriculture for the fall season of 1919. In 1919 the average retail price of the samples analyzed in New Hampshire was $33.20. This wide difference in price in the different brands again shows the necessity for careful buying of fertilizers.

AMMONIATED PHOSPHATES.

Six samples of ammoniated phosphates analyzed varied from 1.64 to 5.80 per cent of nitrogen and from 10.10 to 14.83 per cent of available phosphoric acid. The average price of these brands was $59 per ton. By subtracting the average cost of phosphoric acid upon the basis of $1.72 per unit as found in the acidulated phosphates from the average total cost of the ammoniated phosphates and dividing this by the average per cent of nitrogen we find that the nitrogen in the acidulated fertilizer cost about $12.33 per unit. This is very high compared with the cost of $5.56 per unit in sodium nitrate and $6.90 in ammonium sulphate.

Four samples of sheep manure were analyzed with guarantees ranging from 1.80 to 1.85 per cent of nitrogen, 1.20 to 1.50 per cent of phosphoric acid and from 1.00 to 3.00 per cent of potash. The average price of these sheep manures was $63.75 per ton. Figuring their value upon the basis of the cost of phosphoric acid in acid phosphate of $1.72 per unit, potash in muriate of potash as $3.70 per unit, and nitrogen in ammoniated phosphates at $12.33 per unit, we find the average value of these sheep manures to be $32.39 per ton. Their cost was just about twice their commercial value.

DEFICIENCIES IN ANALYSIS.

Out of the 100 samples analyzed 22 or 22 per cent showed a deficiency of 0.2 of a per cent or more in one or more of the plant foods, nitrogen, phosphoric acid and potash. Some of these deficiencies were as much as 0.5 of a per cent or more. This indicates a serious loss to the farmer using the brands which showed these deficiencies.

ANALYSIS OF BRANDS.

The following table shows the detailed results of the analysis of the different brands. In the table the names of the manufacturers are arranged alphabetically and under the names of each manufacturer the different brands are arranged alphabetically.

Analyses of Brands.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
			Total.		Available.			
	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.
AMERICAN AGRICULTURAL CHEMICAL COMPANY, New York, N. Y.								
Bradley's Complete Manure	4.94	4.97	7.00	7.49	6.00	6.32	4.00	4.28
Bradley's Corn Phosphate	1.65	1.69	9.00	9.58	8.00	8.11	2.00	1.96
Bradley's Eclipse Phosphate	0.82	0.82	9.00	9.03	8.00	8.57	2.00	2.18
Bradley's Northland Potato Grower	3.29	3.72	9.00	9.85	8.00	8.54	4.00	4.23
Bradley's Potato Fertilizer	1.65	1.79	9.00	10.04	8.00	9.44	3.00	3.12
Bradley's Potato Manure	2.47	2.50	9.00	9.34	8.00	8.35	4.00	4.00
Bradley's XL Super Phosphate	2.47	2.59	10.00	10.80	9.00	9.86	2.00	2.41
Crocker's Ammoniated Corn Phosphate	1.65	1.60	9.00	9.58	8.00	8.77	2.00	2.00
Crocker's Potato Hop and Tobacco Fertilizer	1.65	1.87	9.00	9.48	8.00	8.84	3.00	3.03
Darling's Farm Favorite	1.65	1.57	9.00	9.11	8.00	8.13	2.00	1.73
Darling's Potato Fertilizer	1.65	1.84	9.00	9.00	8.00	8.35	3.00	3.29
Grass and Oats Fertilizer	.....	.....	13.00	13.15	12.00	12.00	2.00	2.12
Great Eastern General 1-8-4	0.82	0.87	9.00	9.00	8.00	8.00	4.00	4.41
Great Eastern Northern Corn 2-8-2	1.65	1.60	9.00	9.00	8.00	8.00	2.00	2.05
Great Eastern Potato Manure, 1920	1.65	1.69	9.00	9.01	8.00	8.18	3.00	3.14
Monarch Potato Manure	3.29	3.40	9.00	9.90	8.00	8.20	4.00	4.04
Pacific Potato Special	1.65	1.79	9.00	9.31	8.00	8.45	3.00	3.11
16% Plain Superphosphate	.....	.....	17.00	17.00	16.00	16.60	.....	.....
Quinnipiac Corn Manure	1.65	1.65	9.00	9.39	8.00	8.05	2.00	2.00
Quinnipiac Potato Phosphate	1.65	1.60	9.00	9.59	8.00	8.83	3.00	3.05
Soluble Pacific Guano	1.65	1.73	9.00	9.38	8.00	8.20	2.00	2.33
Special Ground Bone	2.06	2.47	28.00	29.84	.....	.....	.....	.....
Universal Phosphate	0.82	0.79	9.00	8.11	8.00	8.01	2.00	1.84
Williams & Clark Americus Corn Phosphate	1.65	1.73	9.00	9.53	8.00	8.11	2.00	2.07
Williams & Clark Americus Corn Phosphate without Potash	1.65	1.77	11.00	11.69	10.00	9.62	.....	.....
Williams & Clark Americus Potato Manure	1.65	1.78	9.00	9.39	8.00	8.44	3.00	3.14

ARMOUR FERTILIZER WORKS, Chrome, N. J.								
Armour's Acid Phosphate	.....	.....	16.50	16.74	16.00	16.68	.....	.....
Armour's Bone, Blood and Potash	4.11	4.13	8.50	8.98	8.00	8.00	7.00	6.75
Armour's Cereal Special, No. 1	1.65	2.90	10.50	10.66	10.00	10.17	6.00	6.38
Armour's Cereal Special, No. 2	1.65	1.65	10.50	11.20	10.00	10.07	4.00	4.04
Armour's 4-10 Fertilizer	3.29	3.04	10.50	11.00	10.00	10.11	.....	.....
Armour's Grain Grower Fertilizer	1.65	1.53	8.50	8.56	8.00	8.06	2.00	1.72
Armour's Potato, Onion and Vegetable Fertilizer	3.29	2.78	8.50	8.87	8.00	8.18	4.00	4.29
BOWKER FERTILIZER CO., Boston, Mass.								
Bowker's 16% Acid Phosphate	.....	.....	17.00	17.00	16.00	16.29	.....	.....
Bowker's All Round Fertilizer	2.47	2.34	9.00	9.63	8.00	8.55	4.00	4.23
Bowker's Corn, Grain and Grass	1.65	1.48	9.00	9.15	8.00	8.26	2.00	2.08
Bowker's Hill and Drill Phosphate	2.47	2.52	10.00	10.00	9.00	9.36	2.00	2.05
Bowker's Potato and Vegetable Phosphate	1.65	1.79	9.00	9.00	8.00	8.19	3.00	3.00
Bowker's Sure Crop Phosphate	0.82	0.82	9.00	9.04	8.00	8.53	2.00	2.03
Stockbridge Complete	4.11	4.11	9.00	9.24	8.00	8.03	4.00	3.79
Stockbridge Market Garden Manure	3.29	3.15	9.00	9.45	8.00	8.75	4.00	4.12
JOSEPH BRECK & SONS CORP., Boston, Mass.								
Pulverized Sheep Manure (Ram's Head Brand)	1.84	2.16	1.25	1.31	.....	.....	3.00	3.00
BURLINGTON RENDERING CO., Burlington, Vt.								
Burlington Fertilizer 3-8-4	2.46	2.50	9.00	10.68	8.00	8.82	4.00	4.39
CHICAGO FEED AND FERTILIZER CO., Chicago, Ill.								
Magic Sheep Manure	1.85	1.61	1.50	1.53	.....	.....	1.25	1.72

Analyses of Brands—Continued.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
			Total.		Available.			
	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.
THE COE-MORTIMER CO., New York, N. Y.								
E. Frank Coe's Celebrated Potato Fertilizer	3.29	3.33	9.00	9.00	8.00	8.00	4.00	3.79
E. Frank Coe's Columbian Corn and Potato Fertilizer	1.65	2.01	9.00	9.38	8.00	8.29	3.00	3.19
E. Frank Coe's Corn King	2.47	2.35	10.00	11.35	9.00	9.04	2.00	2.37
E. Frank Coe's New England Special	0.82	1.02	9.00	10.80	8.00	10.00	2.00	2.26
COLUMBIA GUANO CO., Baltimore, Md.								
Columbia Famous Trucker	3.30	2.87	8.50	10.20	8.00	8.11	7.00	6.48
Columbia High Grade 16% Acid Phosphate	.....	.....	16.50	17.73	16.00	16.33	.....	.....
JOHN C. DOW COMPANY, Boston, Mass.								
Dow's Garden Fertilizer	3.70	3.70	15.00	20.19	12.00	14.83	.....	.....
ESSEX FERTILIZER CO., Boston, Mass.								
Essex Farm and Garden 2-8-2	1.64	1.35	9.00	9.25	8.00	7.26	2.00	2.00
Essex Fish Fertilizer 3-8-3	2.46	2.20	9.00	9.30	8.00	7.18	3.00	2.89
Essex for All Crops 2-8-3	1.64	1.82	9.00	10.23	8.00	8.54	3.00	3.17
Essex Market Garden	2.46	2.92	9.00	9.12	8.00	8.15	4.00	4.03
J. P. HAWS, Boston, Mass.								
Muriate of Potash	.....	.....	.....	.....	.....	.....	52.11	49.99

INTERNATIONAL AGRICULTURAL CORP., Woburn, Mass.								
Buffalo Economy	1.60	3.12	9.00	9.73	8.00	8.72	2.00	2.37
Buffalo Farmer's Choice	0.80	1.07	11.00	11.66	10.00	10.00	2.00	2.16
Buffalo General Favorite	0.80	0.99	9.00	9.90	8.00	8.27	1.00	1.48
Buffalo New England Special	1.60	1.71	11.00	11.99	10.00	10.01	4.00	4.17
Buffalo Top Dresser and Starter	5.80	5.68	7.00	7.88	6.00	6.61	.....	.....
LISTER'S AGRICULTURAL CHEMICAL WORKS, Newark, N. J.								
Lister's Corn and Potato Fertilizer	1.65	1.75	9.00	9.00	8.00	8.04	3.00	3.26
Lister's Eastern Pride Fertilizer	2.47	2.33	9.00	9.35	8.00	8.16	4.00	4.26
Lister's Fertilizer 4-8-4	3.29	3.01	9.00	9.68	8.00	8.00	4.00	4.19
Lister's King Bee Fertilizer	1.65	1.65	11.00	13.71	10.00	11.51	4.00	4.13
Lister's Squirrel Brand Fertilizer	0.82	1.05	9.00	10.49	8.00	9.15	2.00	2.31
Lister's Success Fertilizer	1.65	1.87	9.00	10.41	8.00	8.78	2.00	2.39
LOWELL FERTILIZER CO., Boston, Mass.								
Acid Phosphate	.....	.....	17.00	16.78	16.00	16.74	.....	.....
Ground Bone	2.05	2.36	26.00	26.05	.....	.....	.....	.....
Lowell 3½-10	2.87	3.06	11.00	13.62	10.00	10.68	.....	.....
Lowell 5-8-7	4.10	4.29	9.00	9.15	8.00	8.24	7.00	7.58
Lowell Animal Brand 3-8-4	2.46	2.46	9.00	9.40	8.00	8.41	4.00	4.25
Lowell Bone Fertilizer 2-8-2	1.64	1.36	9.00	8.94	8.00	6.57	2.00	2.01
Lowell Corn, Grain and Vegetables 3-8-3	2.46	2.58	9.00	9.40	8.00	8.05	3.00	3.00
Lowell Dissolved Bone Fertilizer	1.64	1.44	11.00	13.47	10.00	11.45	.....	.....
Lowell Empress Brand 1-10-1	0.82	0.82	11.00	11.80	10.00	10.51	1.00	1.54
Lowell Lawn Dressing	3.28	3.17	8.00	9.41	7.00	7.17	2.00	2.00
Lowell Potatoes, Corn and Vegetables 4-8-4	3.28	3.36	9.00	9.02	8.00	8.05	4.00	4.06
Lowell Vegetables and Grain 2-8-3	1.64	1.66	9.00	9.22	8.00	8.07	3.00	3.24
Nitrate of Soda	15.00	15.58	.....	.....	.....	.....	.....	.....
Sulphate of Ammonia	20.00	20.82	.....	.....	.....	.....	.....	.....

Analyses of Brands—Continued.

	NITROGEN.		PHOSPHORIC ACID.				POTASH.	
			Total.		Available.			
	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.
MANCHESTER RENDERING CO., Manchester, N. H.								
Manchester Animal Brand Fertilizer	2.89	3.01	.....	16.26	10.00	10.79	4.00	4.21
Manchester Ground Bone	2.05	2.79	28.00	28.06	.....	.....	.....	.....
Manchester Special Fertilizer for all Crops	1.64	1.99	14.00	18.57	10.00	10.59	3.00	3.81
Tankage	6.25	6.25	.....	16.48	7.00	11.43	.....	.....
Tankage and Bone—75% Tankage, 25% Bone	5.00	5.10	.....	17.51	10.00	10.10	.....	.....
NEW ENGLAND FERTILIZER CO., Boston, Mass.								
New England 3-8-3	2.46	2.46	9.00	9.93	8.00	8.14	3.00	3.08
New England 4-8-4	3.28	2.90	9.00	9.77	8.00	8.03	4.00	4.34
New England 4-8-6	3.28	2.78	9.00	9.89	8.00	8.22	6.00	5.77
New England Corn Phosphate 2-8-2	1.64	1.36	9.00	8.70	8.00	6.80	2.00	2.00
New England Super-Phosphate 3-8-4	2.46	2.22	9.00	9.04	8.00	8.26	4.00	4.01
NITRATE AGENCIES CO., New York, N. Y.								
Acid Phosphate, N. A. C. Brand	.....	.....	.....	.....	16.00	16.51	.....	.....
Muriate of Potash	.....	.....	.....	.....	.....	.....	49.00	50.16
Nitrate of Soda	15.00	15.18	.....	.....	.....	.....	.....	.....
PACIFIC MANURE AND FERTILIZER CO., San Francisco, Cal.								
Pulverized Sheep Manure, Groz-It-Brand	1.84	1.50	1.25	1.06	.....	.....	3.00	2.58

PARMENTER & POLSEY FERTILIZER CO., Boston, Mass.								
P. & P. Plymouth Rock Brand 3-8-4	2.46	2.14	9.00	9.15	8.00	8.13	4.00	4.00
THE PULVERIZED MANURE CO., Chicago, Ill.								
Wizard Brand Manure	1.80	1.95	.....	1.20	.....	.....	1.00	1.37
THE ROGERS & HUBBARD CO., Portland, Conn.								
Complete Phosphate	0.82	0.71	9.00	9.38	8.00	8.64	2.00	2.08
Potato Phosphate	1.64	1.46	9.00	10.23	8.00	8.34	4.00	3.90
F. S. ROYSTER GUANO COMPANY, Baltimore, Md.								
Nitrate of Soda	15.00	15.32	.....	.....	.....	.....	.....	.....